

SOLVENT EXTRACTION AND CHEMICAL DERIVATIZATION OF ORGANIC MOLECULES OF EXOBIOLOGICAL INTEREST FOR IN SITU ANALYSIS OF THE MARTIAN REGOLITH

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Mars is presently the most likely planet on which there is a possibility of finding extinct and/or extant life. Future exploratory missions to Mars in search of evidence for life will focus on key organic molecules such as carboxylic and amino acids. The 2009 Mars Science Laboratory (MSL) Mission will offer an opportunity to carry out in situ measurements for organic compounds on Mars. , Gas chromatography mass spectrometry (GC/MS) is one technique that will be proposed for MSL. We are currently developing an automated extraction process coupled to chemical derivatization in order to target several key organic compounds using GCMS.

This paper presents a solid-liquid extraction method (1) that can be coupled with in situ GC/MS analyses of organic compounds on Mars. The extraction efficiencies of several different organic solvents including (isopropanol and water) have been determined ,for several Martian soil analog materials such as an Atacama Desert soil sample from Chile (2). It was shown that isopropanol is the best solvent, allowing high extraction yields for both amino and carboxylic acids with space compatible extraction time (15 to 30 min) when the extraction procedure is assisted by sonication. A highly sensitive and quantitative single-step derivatization reaction was carried out using N-methyl, N-tert.-butyl (dimethylsilyl) trifluoroacetamide (MTBSTFA) as the silylating agent prior to GC/MS analysis. The development of a miniaturized reactor, where both the extraction and the derivatization processes could take place is currently under investigation. This method is discussed for an easy automation with coupling to an in situ GC-MS space instrument.

(1) A. Buch et al., *J.of Chrom. A*, 999 (2003) 165-174

(2) R. Navarro-González et al., *Science* 302 (2003) 1018-1021